JPRS 69194

3 June 1977

EAST

EUROPE

TRANSLATIONS ON EASTERN EUROPE

SCIENTIFIC AFFAIRS

No. 547

U. S. JOINT PUBLICATIONS RESEARCH SERVICE

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BIBLIOGRAPHIC DATA SHEET	1. Report No. JPRS 69194	2.	3. Recipient's Accession No.
4. Title and Subtitle TRANSLATIONS ON EASTERN EUROPE - SCIENTIFIC AFFAIRS, No. 547			5. Report Date 3 June 1977 6.
7. Author(s)			8. Performing Organization Rept. No.
9. Performing Organization Name and Address Joint Publications Research Service 1000 North Glebe Road Arlington, Virginia 22201			10. Project/Task/Work Unit No. 11. Contract/Grant No.
12. Sponsoring Organization Name and Address As above			13. Type of Report & Period Covered 14.

15. Supplementary Notes

16. Abstracts

The serial report contains articles concerning the development of and progress in the various theoretical and applied scientific disciplines and technical fields; and the administration, structure, personnel, and research plans of leading East European scientific organizations and institutions, particularly the academies of sciences.

17. Key Words and Document Analysis. 17a. Descriptors

___ International Affairs
X Albania
___ Bulgaria
___ Czechoslovakia
___ East Germany
X Hungary
___ Poland
X Romania
X Yugoslavia
Scientific Societies
Research Management
Organizations
Research

17b. Identifiers/Open-Ended Terms

17c. COSATI Field/Group 5B

18. Availability Statement	19. Security Class (This Report)	21. No. of Pages
Unlimited Availability Sold by NTIS Springfield, Virginia 22151	UNCLASSIFIED	46
	20. Security Class (This Page) UNCLASSIFIED	22. Price PC A03

JPRS 69194

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CONTENTS PAGE

REPORT ON SESSION OF ACADEMY OF SCIENCES

Tirana ZERI I POPULLIT in Albanian 21 Apr 77 p 3

[Article by Stefan Kenuti: "Our Science Is Marching Forward on the Road Shown by the Party"]

[Text] The expanded meeting of the Academy of Sciences of the People's Socialist Republic of Albania and the meetings of its sections, which convened on 18 and 19 April, represent an important event for the science workers and the workers of our whole country. The high scientific level, the sound partisan spirit, the serious concern about bringing up concrete problems and the tasks facing our sciences in the light of the historic decisions of the Seventh Party Congress are the principal characteristics of those transactions.

In the report of the president of the Academy of Sciences of the PSRA [People's Socialist Republic of Albania], Prof Aleks Buda, in the speech of Comrade Nexhmije Hoxha and in the 24 reports by various branches of the economic-social, natural and technical sciences, it was stressed that--under the party's leadership and enforcing its directives and the many valuable teachings of Comrade Enver Hoxha--our sciences have achieved a multitude of important successes in studying, generalizing and solving a good many problems and phenomena of our socialist development. The studies made--in the philosophical and historical sciences; in the economic and linguistic sciences; in the fields of agriculture, chemistry, mathematics and physics, as well as the studies in a number of technical sciences such as hydro-energy, geology and petroleum, seismology, city planning, mechanics, and so forth; and the whole qualitative and quantitative development of our science--attest not only the great theoretical and practical values of those generalizations, but also the significant fact that, under the conditions of the socialist order and having Marxist-Leninist theory and the party's correct line as guideposts, science can march securely forward and enjoy an all-around development, as is the case in our country. The creation of a broad army of production cadres and specialists, equipped with wide scientific knowledge and Marxist-Leninist methodology and the establishment of a wide network of institutes, chairs, stations, scientific and experimental nuclei, and technological bureaus--carrying on study and experimental work from the center down to the localities--certainly

represent important successes for our science and a secure base for responding adequately to the tasks set for it by the Seventh Party Congress.

Our science has developed and is developing in close conjunction with the tasks set it by the sociopolitical and economic-cultural development of our country on the road to socialism, and its course has always been staked out by the party's correct Marxist-Leninist orientations. In this sense, the decisions of the Seventh Party Congress and the tasks set for science in that congress by Comrade Enver Hoxha are new and higher objectives, more difficult but fully realizable, which will move our science still farther ahead and will make its results more effective in practice. In putting those orders into effect, it was said at the meeting, our sciences are faced with great tasks.

One of the most important tasks for science, as for the whole country, is the successful fulfillment of the Sixth Five-Year Plan. The fact that this five-year plan, because of the present conditions of the imperialist-revisionist blockade under which we are building socialism, rests more than any other plan upon our [own] forces and possibilities (including the preponderant part of the investments, the domestic provision of bread, the 90 percent fulfillment of the people's needs for consumer goods, the domestic production of 95 percent of the spare parts, the opening of a large number of mines, ore-enriching plants, other installations, hydroelectric plants, and so forth), as well as the fact that the indicators of this plan are several times higher than those of the previous plans and the large increase in production will be achieved principally by increasing labor productivity, [all these facts] make it necessary to apply science and its results on a wide scale in production and every other field. The scientific workers have the task of breaking the encirclement, by their scientific activity in union with the working class and the working masses and by solving a number of acute technical and technological, economic and scientific problems. In view of these tasks, it was said at the meeting, priority has been given in the field of the technical sciences to studies and plans connected with the country's main hydroelectric projects, to geologic, geophysical, mineral and other studies relating to the exploration of new petroleum and gas-bearing areas and deposits of chromium, copper, coal and other minerals. Within this framework, a special role belongs to geology, which must not only lead the way in the development of industry but also open up new paths of development. Integrated studies, both here and in petroleum, must constitute the method of research, not only to increase scientific accuracy but also to go on to multilateral geologic generalizations.

Likewise, mechanical studies and plans for the domestic production of a number of complete technological machines, equipment studies for planning and building easily constructed designs, studies on ways of effective use of lumber, and so forth serve precisely to perform the tasks set in the Sixth Five-Year Plan in these fields. But more direct assistance is required of science, it was stated at the meeting, in order to insure domestically the most important raw and other materials and their sources--which are of paramount significance for our independence and socialist economy--and to discover and exploit our

large natural resources, such as the finding and rational exploitation of phosphorites, quartz sands and fire clays; the production of white cement from limestone; the exploitation of subsoil waters and lumber and so forth. Equally important is study for the exploitation of the "residues" of useful raw materials, the rational exploitation of existing production capacities--for example, the stock of metal-cutting machines--and so on.

Agriculture's great tasks in this Five-Year Plan, such as the domestic provision of bread, the integrated and harmonious development of all its branches, increased soil fertility, the placement of crop rotation on the basis of scientific criteria, the increase in the efficiency of the use of chemical fertilizers, the creation of select seeds and hybrids, the control of diseases and pests, the increase in mechanization and so forth are tasks on which our science must have a more powerful say, it was stated at the meeting.

Important tasks in this five-year plan also face the other natural sciences, such as mathematics, physics, chemistry, biology and so forth. In these fields, it was said at the meeting, important successes have been achieved under the continual care of the party, and valuable studies in the service of the economy and production have been made. But, as rightly emphasized in the meeting, a greater effort must be made to raise the theoretical level of those sciences and the degree of collaboration between them. This will not only cause science to move ahead more rapidly, but will serve at the same time as a sound basis for the more rapid progress of a number of other related sciences such as agriculture, zootechnology, medicine, mechanics, construction, petroleum and so forth.

The great tasks set by the Seventh Party Congress for the social sciences, too, have caused the workers in this sector to plan for this five-year period subjects and studies devoted to theoretical experience and the sociopolitical thought of the party and Comrade Enver, to the party's leading role in the socialist revolution, to the class struggle and the strengthening of the dictatorship of the proletariat and to perfecting socialist relationships in production. Important studies will be made on the history of the Antifascist National Liberation War, on popular culture, on the grammar of the modern Albanian literary language and dictionaries of modern Albanian, on the history of our literature of socialist realism and so forth. These studies, it was stated at the meeting, serve the work of the party and must serve it better in the revolutionary education of the communists and the masses.

The development of science in the socialist society cannot be conceived as a day-by-day development, to resolve only the problems and tasks of the day. The very development of our socialist society necessarily dictates to our sciences the necessity of an organic connection of the present tasks with the prospective ones.

This means that, on the basis of the party's orders, our sciences, without distracting attention from the study and generalization of the great problems of the day--and for us these problems are those having to do with realizing

the tasks of the Sixth Five-Year Plan--we must program their work and put them to work to solve the problems of the future development of our country. Indeed, it was stressed at the meeting, every matter connected with the present tasks must be studied closely not only in order to solve these problems but also in a prospective framework. Only in this way will our studies set the pace for every kind of work and task; only so will the present serve the prospective future. At the same time, the making of genuine studies with a prospective character regarding the forecast plans for 10-15 year periods--for example for the development of the productive forces and socialist relationships in production, for the revolutionization of the superstructure and so forth--will divest the present studies of the fragmentary character dictated by the needs of the moment, with purely economic-statistical data and so forth.

It was stated that prospective studies to determine in what way the hill and mountain regions are to be developed and what stage they are to reach in 10 or 20 years do exist at present neither on a district-wide scale nor for the whole country. But can we leave this problem to the "minor" studies of the day at a time when the biggest reserve in the form of opening up new lands is to be found in those regions, about half the population lives there and nearly 45 percent of the arable land area is there? The need to make such long-term prospective studies, it was stated at the meeting, has also arisen with regard to such important problems as the enlargement of the various sources of energy; studies on the natural laws governing minerals and the mineral-bearing prognostication for our subsoil; studies on the further intensification of agriculture; studies on the prospective demographic development of the country--on the prospective development on the district, region and republic-wide scale--and so forth and so on. These studies, which will be made with constant consideration for the orienting landmarks for the general development of the country designated by the party, would serve not only as a foundation for the all-around activity of the governmental planning organs, but at the same time they would be a sound basis for the planned and coordinated development of the various scientific disciplines in our country.

It was stressed at the meeting that in science, as everywhere else, the class struggle is being waged intensively and in an all-around manner. A right understanding and consistent conduct of the class struggle within science itself are of decisive importance for the successful defense and construction of socialism in our country and for the defense of the purity of Marxism-Leninism against modern revisionism and all reactionary falsifications, not only on a national scale but also internationally; and they have to do with all aspects--politico-economic, ideotheoretical and scientific. This struggle encompasses not only certain branches of the sciences, but also those which the bourgeois-revisionist ideologs try to represent as "neutral" and "above class." Thus, the class struggle assumes a sharp and delicate character not only in the philosophical, economic, linguistic and historical sciences, but also in the biological, mathematical, chemical and medical sciences and even in the technical sciences. This struggle, which is really going on in our sciences and is the motive force pushing them forward, has been and is being directed against the influences of idealistic and metaphysical philosophy--against idealistic currents and eddies. But at the same time it is also

directed against manifestations of objectivism, against the unscientific and pseudo-scientific remnants manifested in some work and against subjection to the "big science" of other countries. The strengthening of class tendentiousness in our scientific studies, it was stated at the meeting, and the uncompromising fight against reactionary and idealistic theories are an important and continuing duty for all our sciences. In this respect, the science workers must make a greater contribution to unmasking the bourgeois-revisionist theses on the development of the socialist society, expose in depth the causes of revisionist degeneration in the Soviet Union and so forth.

This class struggle also brings up the necessity of carrying on a higher degree of scientific debate and criticism, which, as emerged from the reports, is not on a adequate scale in a good many fields, or is lacking entirely. There must be no study or scientific publication that is not subjected to such criticism.

It was stressed at the meeting that it is necessary to broaden and further deepen the conception that we have of scientific work and the "massivization" of science. It must not be thought that science is developed and "massivized" by adding new institutes or by concentrating all scientific work in scientific institutes and centers alone. The fact that about 4,500 scientific workers are employed in 32 scientific institutions of the country does not mean at all that they alone do all the scientific work in our country. Today, our broad masses of workers in town and country engage in science and scientific experiment. This is a concrete application of the principle of the line of the masses in science. The task is to see to it that all these local forces, including 28,000 higher specialists and over 50,000 others with secondary education, are involved in a more organized and better directed manner in scientific research work.

Also emphasized at the meeting was the importance of the party's great principle of self-reliance as an imperative necessity for our science as well, which must apply creatively the general laws to our concrete conditions, finding solutions to the many great and complex problems in the field of the economic, social, technical and natural sciences.

During the whole meeting, and especially in the speech by Comrade Nexhmije Hoxha, it was stressed that science, like our whole life, is guided by the party. This is primarily ideological and political guidance; hence, the strengthening of the party's leadership in the sciences requires that all men of science be guided in their work by the party's proletarian ideology and policy. Great tasks confront the party committees and the local organizations, which, without exception, wherever they may work, must heighten their care to organize and direct scientific work by also organizing studies themselves. Important tasks also face the central government departments in doing more thorough generalizing study work, collaborating more among one another, too, and strengthening their ties with the central organizations of the masses.

10002
CSO: 2102

CURRENT TASKS OF GEOLOGICAL RESEARCH OUTLINED

Tirana ZERI I POPULLIT in Albanian 7 Apr 77 pp 2-3

[Article by Kristaq Papa: "Geology Is A Science With a Strong, Precise and Controllable Discipline"]

[Text] Comrade Enver stated at the Seventh Party Congress: "A special role belongs to geology in further fortifying the economy and guaranteeing the most powerful raw material and energy base for industry. It must take the lead in developing industry and open up new paths." This evaluation and great assignment indicate the very important place held by geologic exploration and research in our whole industrial development. According to the directives of the Sixth Five-Year Plan, the volume of drillings for petroleum and gas in 1980 will be 80 percent larger than in 1975, and that for other minerals will increase 70 percent. These will lead geologic research to fulfill its main task, that of discovering petroleum reserves 4 times more than in the past five-year plan, and for the other minerals taken together the increase will be 34 percent, with priority being given to chromium, copper and coal. They will thus not only insure the planned extraction of minerals and fuels, but will also produce an active balance in the reserve situation at the end of the Sixth Five-Year Plan in comparison with the past five-year plan.

A main task set by the Seventh Party Congress for the geology workers is to attach importance to the expansion of the existing deposits, on which the main means and resources are also concentrated, so as to insure the highly effective use of material and financial means. Regarding the existing deposits, there are serious preparations afoot to gain the geologic and mineralogical knowledge required for making geologic explorations. This is confirmed by the many years' experience of our geologists, and by their successes in discovering certain oil and gas deposits and copper, chromium and iron-nickel ore deposits around and beneath the deposits now under exploitation. In addition to the positive results in exploration, this experience in increasing industrial reserves makes it easy to exploit them with smaller investments.

Another very important task is that of discovering new deposits of petroleum, gas and principal minerals such as chromium, copper, iron-nickel and coal.

In this connection, Comrade Enver Hoxha directs that "precise generalizations should be made of the factual data in order to achieve useful discoveries with the smallest possible expenditure." The discovery of new oil deposits is the fundamental task of the oil men, so as to get this sector out of its condition of backwardness. This requires a more thorough ideological and political understanding of the task, so that all the workers engaged in geology, drilling, the extraction of petroleum and so forth, may be mobilized and raise the quality of operations and studies for the preparation of the structures to be subjected to exploration.

The Seventh Party Congress stressed that during this five-year plan importance must also be attached to other known and unknown minerals. The task of the geologists and of all the mine industry workers and the great mass of popular geologists is to increase those geological reserves and convert them into industrial reserves, by joining together all the many mineral "finds and points" in order to make it possible to exploit them. But the important thing is not only to make industrially important discoveries of those minerals but also to make laboratory studies and experiments, even in pilot and semi-industrial plants, for extraction and enrichment and to find metallurgical ways of recovering the metals from those ores.

The tasks set by the Seventh Party Congress in the geology field are great. Their performance is connected primarily with the strengthening of the leading role of the party organizations in directing all the ideopolitical and research work in this field. As emphasized in the congress, the geology workers must increase their vigilance and strengthen their efforts to remove the traces of the hostile work of Abdyl Kellezi, Koco Theodosi and so forth, especially by rooting out distorted and reactionary concepts.

The party organizations, in the fight to apply the party's decisions and Comrade Enver's teachings, have striven primarily to root out harmful concepts in geological exploration, such as that it is futile for us to concern ourselves with the existing deposits, that you can't look beyond the green lines and so forth. In this respect, good results have been obtained both in petroleum and in the search for other minerals. Understanding the importance of raising the Marxist-Leninist ideopolitical level of the cadres and all the workers of this sector, the aim of all educational work is to inculcate in them a correct understanding of the task and role entrusted to them in discovering quickly and at the lowest cost new deposits of petroleum, gas, coal and other useful minerals.

Equally important is the exposure of and organization of the fight against other alien concepts in geology which influence the establishment of wrong methods of exploration. One of these is the theory of "lenses and pockets" or "spots," both for petroleum and for hard minerals. This has a metaphysical base. Marxist dialectics teaches us that no natural phenomenon can be understood if taken in isolation: It must be taken in close conjunction with the phenomena which surround it and as conditioned by them. Proceeding from this method and applying the party's directives more correctly in their

concrete work, the geologists have not only found petroleum in places abandoned by the saboteurs as small pockets or lenses, but have subsequently discovered a deposit of condensed gas. In the Mat, Mirdite, Diber and Puke districts, new mines with a good production capacity have now been planned and built from the spots formerly left as unimportant for chromium and copper.

Comrade Enver's teaching that "geology is a science with a strict discipline, demanding controllable precision in every operation and at every moment" should guide the whole activity of the geology workers. Geology is a science like all others, with laws and methods confirmed in practice which guide operations correctly; it is not a hypothetical science that has no universal laws. It has the materialistic dialectic method of study proceeding from the known to the unknown; it embodies and has in its service other sciences such as geophysics, geochemistry, paleontology, petrography and so forth, which have their physical, mathematical and chemical bases. Like the other sciences, geology does not tolerate stereotyped methods in its study or failure to watch systematically over the stages of operations to verify the data and interpretations made. Hence, the party organizations and the regional and district party committees must concern themselves seriously with the problems of geology and must not leave them solely in the hands of the specialists.

The party has always insisted that the use of integrated methods in geologic research is one of the main conditions for success, for increasing its effectiveness. Often, due to lack of preparation, to some organizational and technical difficulties, various methods are underestimated, and the geologists themselves do not seek to introduce them into geologic exploration. This is encountered in particular specialists and workers who, in order to avoid responsibility for precision in operations and studies and not to have to leave their laboratories and their small volumes of work, allow themselves to be guided by personal interest and do not strive to make those methods obligatory in geologic research. Geophysical and geochemical methods are known to us and used by us both for petroleum and in the search for other minerals. In the case of petroleum, they have become methods that have entered into the whole set of operations and are left only with the problem of improving the quality of field operations and interpretation. But in the case of hard minerals, they are not yet being introduced to the required extent. The geophysics workers and communists in Tirana need to understand that their work is not being done to satisfy themselves, just in order to say that we have geophysicists, but to open up for geology the prospects for exploring for useful minerals, for increasing the precision of this research and for lowering its cost. Or take another case: The Institute of Nuclear Physics has succeeded in analyzing bauxite specimens with a very high yield, but no geological enterprise searching for that mineral sends specimens there for analysis because the geologists there [in Tirana] do not know those methods, have no confidence, do not agree with that institute and find it easier to follow the old method of chemical analyses that takes longer and costs more.

To do this, it is necessary to overcome certain difficulties and to remove the existing weaknesses resulting from the extension and increase in problems and demands--some due to intellectualistic and technocratic ideas and attitudes

and others due to the relative backwardness in true scientific thought, or to shortcomings in the organization and direction of scientific study. Of decisive importance here is the enhancement of the party's leading role, its organizing work in solving these problems correctly and in due time. The party organizations must show special care for the ideopolitical and vocational education of the workers and concern themselves more with the very acute problems of training the cadres. The party organizations must increase their care in stimulating in all workers a desire and will to study and assimilate science and technology and to put them into practice to an ever greater extent.

The development of the technical-scientific revolution in our country daily brings out new reserves, among which the greatest is advanced experience. The party has attached and is attaching great importance to generalizing and disseminating it. Every important victory won by the worker collective in solving production problems must be recognized, assimilated and applied by other collectives as well. The task of all the party organizations is for us to gird ourselves for the work of developing further the movement of many collectives to assimilate and apply advanced experience and to organize the work of advancing it still further. In geology there are many teams, drilling brigades and shifts in mining operations, generalization groups and so forth which have become standard-bearers. Their organization, scientific methods, technology and techniques need to be analyzed, studied for the concrete conditions of the other brigades and applied, so that this great and inexhaustible reserve may be put in the service of the realization of the tasks set by the Seventh Party Congress.

In geologic exploration, as hitherto in the fight and effort to build socialism, the party teaches us to adhere resolutely to the great Marxist-Leninist principle of self-reliance. In the geology field, the application of this principle is achieved by relying primarily on the strength and critical thinking of the working masses about every problem, however technical and scientific, down to their participation in studies to determine the prospective structures and areas where drilling is to be done or other exploratory operations are to be started. Comrade Enver Hoxha at the Seventh Party Congress enjoined that "all geologists must courageously scan the mountains and the plains span by span, arm in arm with the popular prospectors, and evaluate with the utmost seriousness every trace, every datum and every discovery." The history of the discovery of our deposits tells of the great contribution made by popular geologists not only by reporting signs of minerals, but also by finding large deposits of chromium, copper, coal, iron-nickel, and so forth. The party organs in geology have tried to educate the cadres and all the workers in geology to feel respect for those prospectors and to interest themselves at once in verifying the evidence presented.

The principle of self-reliance is also connected with the exploitation and highly efficient use of the machinery and equipment at the disposal of every team, expedition and brigade. Alien to us are indifferent attitudes toward the misuse of those means, expressed both in the failure to exploit the full capacities of the machinery and in the failure to maintain them well and the

scattering of them far and wide, as may be observed throughout the drilling areas or in the bases of the geologic teams. The fight against breakdowns in drilling equipment, not only to prevent them from increasing but also to reduce them to a minimum, is an important factor in reducing expenditures per ton discovered and the time taken to discover deposits. The good experience of the workers in the petroleum machine industry and the geology machine plant in producing equipment and machinery in this country, including drilling probes and powerful motors, must be promoted so as to contribute also to heightened care in maintaining machinery and lengthening its life as much as possible.

The geology workers, like all other workers in our country, under the leadership of the party headed by Comrade Enver Hoxha, and without considering any obstacle or difficulty, will work heroically and with self-denial to make a reality of all the tasks set by the Seventh Party Congress.

10002
CSO: 2102

VIDEOTON DIRECTOR DEFENDS R-10 COMPUTER

Budapest VILAGGAZDASAG in Hungarian 29 Apr 77 p 3

[Excerpts] In response to recent allegations to the effect that the R-10 computer of the VIDEOTON Factory is not truly competitive, is poorly serviced, lacks suitable software and has fewer accessories than expected today, Jamos Kazsmer, director of the VIDEOTON Computer Technology Factory, presents the following information: "The sphere of computer technology services provided by Videoton is constantly expanding to meet the requirements of consumers." The brochure,'The Service System of the VIDEOTON Computer Technology Factory'reveals that the Factory's bids are competitive under domestic circumstances and provide an acceptable background for sales efforts abroad.

"To meet contractual commitments, the factory maintains about 400 properly trained specialists. The value of reserve parts at service depots amounts to nearly 100 million forints." A constant buyer's service has been established in Budapest, Szekesfehervar, Moscow, Berlin, Prague and Sofia. Of these, the buyer's service center in Moscow is especially noteworthy with its 110 Hungarian and Soviet specialists; the center provides constant service. In addition to the permanent staff, there were about 150 temporary workers at the center in 1976. Offices in Belgrade, Vienna and Warsaw are now being organized.

The volume of services is exemplified by the training being provided. In the course of this, approximately 1,500 technicians or professionals employed by the users will be trained in 1977.

"A review of the statistics reveals that the R-10's supply of software in 1976 ensured it a very favorable position on the market. According to a report prepared by the Computer Applications Research Institute (SZAMKI), the basic and user's software now available and provided by VIDEOTON for the R-10 must be considered an important achievement which currently surpasses the software available for the larger RYAD machines. The value of the programs-if we take into consideration that a complete monitor or programming language, a program system suitable for processing (translation program, file operator) costs 3-5 million forints-in general substantially exceeds the cost of the hardware of an average configuration." The catalogue reveals that supply of optional equipment satisfies the needs consumers and was responsible for establishing such favorable market conditions for VIDEOTON over the past years."

To the foregoing, D. L. of VILAGGAZDASAG replies "We do not consider the reasoning of Videoton sound. Naturally, we showed the letter to independent professionals because it is not against us that Videoton must defend itself. It may be that the products of the factory are competitive, but this would have to be proven through presentation of numerous economic-commerical figures. It may be that the factory has a good service organization; again this is not proven by the number of persons employed, but by their training and qualifications. Furthermore the catalogue sent by Videoton is of no proof that its supply of appurtenances meets the requirements of the users. Most of the software mentioned in the catalogue is category 2 or 3 which means that the factory assumes limited or no responsibility for it. Another question is whether the factory is always prepared to deliver what is advertised in the catalogue. The answer to this is, no. It was a special disappointment that, despite our request, the factory made reference to the software of other RYAD machines whereas a realistic comparison could be made only on the basis of other machines in the same category. Insofar as competetiveness and market possibilities are concerned, these are relative concepts. In theory the best serviced machine in the world could be non-competetive, and vice versa."

CSO: 2502

VARIOUS APPLICATIONS OF SATELLITE PHOTOGRAPHY DISCUSSED

Bucharest STIINTA SI TEHNICA in Romanian No 3,Mar 77 pp 14-16

[Interviews conducted by Constantin Nedelcu]

[Text] Orderly economic development requires the use of increasing amounts of raw materials, such as ores, fuels, water, agricultural resources, and so on. In order to meet these demands, it is becoming necessary to know in the greatest detail, and to rationally exploit existing reserves. Remote sensing is one of the most modern techniques for searching, monitoring, discovering, and inventorying the Earth's resources. In recent years, the application of this method has met with outstanding success, offering great hope for the future.

In Romania, several institutes for technical research and engineering have initiated projects in the application of remote sensing techniques. All of these projects are part of a program coordinated by the National Council for Science and Technology (CNST) through the Romanian Commission for Space Activities (CRAS).

From a conversation with Eng E. Mandescu of CNST, we learned about some of the problems of remote sensing with satellites, and about the advantages which the method offers to the economy.

Remote sensing satellites transmit information about the condition of, and processes on dry land, on the sea, or in the atmosphere, this information being of special interest to geology, hydrology, agriculture, forestry, oceanography, and mapping. The experience gained throughout the world during four and one half years of remote sensing, has led to the conclusion that a large amount of information can be obtained from space, and that this information cannot be obtained by traditional means. As a result, it is expected that in the years to come, remote sensing by satellites will undergo an enormous development, along with the processing and interpretation of the data which they provide.

The results which have been obtained until now have defined the following domains of application: discovery of new deposits of useful minerals, and of geothermal and underground water; increased agricultural production from an improved knowledge of the land; improved use of land, perfected irrigation, monitoring of disease and pest attacks; inventories of forestry land and crops; forecasting of agricultural production; research and monitoring of sea and ocean production; study and monitoring of coastal dynamics; control of environmental pollution; topographic mapping; improved territorial organization and locality planning; discovery of archeological remains; and so on.

These projects are performed with the contribution of the following disciplines: geology, geophysics, pedology, agriculture, forestry, oceanography, hydrology, hydrotechnology, meteorology, geodesics, cartography, geography, and archeology. As an advanced technique, derived from space research, remote sensing uses increasingly improved instruments and installations constructed with the participation of physics, chemistry, electronics, precision mechanics, automation, and information science.

Two remote sensing satellites are presently in operation, circling the earth on polar orbits at an altitude of 915 km, and returning to the same area every 18 days at the same time of day. But being staggered by 180°, each point of the earth is covered every nine days. The satellites are equipped with a sweeping device which simultaneously records in four bands of the electromagnetic spectrum (0.4-0.5, 0.5-0.6, 0.6-0.7, and 0.8-1.1 microns) a 180X180 km zone of the earth's surface. The data is telemetered to ground stations, which distribute it to users in the form of magnetic tapes or photographs. New satellites will be launched in 1977-1978; their performance will be improved in terms of resolution, and of infrared sensing in the 10-12 microns domain. It can be stated with certainty that by the 1980's, the performance of our present remote sensing satellites will seem primitive.

Given the tasks outlined by the 11th Congress for the application of the technical and scientific revolution to all areas of activity in order to increase economic efficiency, experimental studies were started in Romania in 1974 to use the data obtained from remote sensing satellites. This research demonstrated the outstanding advantage of this technique in solving major problems of our economy. In geology, for instance, the new regional tectonics data thus obtained could orient traditional investigations toward new zones of interest; in hydrology, the satellite data was used to draw hydrologic maps for some rivers and storage lakes, as well as to establish new methods for evaluating aquifers; in agriculture, it became possible to inventory cultivated surfaces according to types of crops at different periods of the year, to map soils, and to evaluate crops with satisfactory accuracy.

At the workshop of scientific researchers and technological engineers, Nicolae Ceausescu, secretary general of the party, pointed out that in order to achieve a revolution in science and technology, we must become involved in new technical and technological transformations and in new discoveries, and we must strive for results which are equal or better than those obtained throughout the world. In the light of these indications, steps are being planned even this year, which will lead to an exploitation of research in remote sensing, and to an utilization of this method to solve current production problems in various sectors of economic activity.

The inventorying of natural resources by means of remote sensing is one of the most modern approaches to an investigation of the country's territory. This is what Eng V. Vajdea, chief of laboratory at IGG (Institute of Geology and Geophysics), had to say about the aims of geologic studies by means of remote sensing, and about the advantages of this method over more traditional approaches.

The aims of geologic studies conducted by means of remote sensing methods are: first, to identify the morphology and major geologic formations existing in the areas being investigated, and to separate the various types of rocks; second, to clarify the processes which have led to the occurrence of these rocks; and finally, to represent all the information obtained on a map, as a function of their correct space relationships. The remote sensing data is also used in geologic forecast studies, both in inventorying known mineral resources, and in estimating the reserves of these resources in a given region.

From the standpoint of exploitation, the main goal is to show new exploitable deposits of useful mineral substances. The current active interest of geologists is to discover new deposits located at great depths. These deposits are usually identified by means of geophysical and geochemical prospecting methods, which however are expensive and time consuming. Remote sensing, even though it does not directly identify these deposits, can contribute to limiting the prospected area by defining zones of interest. Under favorable physico-geological conditions, the presence of deposits is associated with various tectonic accidents or other geologic phenomena, whose manifestation at the surface is reflected in remote sensing images. As such, remote sensing is an additional and important means for the geologic investigation of the subsoil and of its mineral resources. This results from the fact that whereas traditional aerial pictures, whose usefulness in geological sciences has been recognized for a long time, are obtained only in the frequency band of the visible spectrum at wavelengths of 0.36 to 0.72 microns, remote sensing images are based on recordings of electromagnetic radiations both in the active ranges (0.3 and 20 microns) and passive ranges (0.5 mm-5 m), thereby considerably extending the possibilities of investigation.

It is currently inconceivable to undertake geologic research in inaccessible regions of the earth, without a preliminary use of remote sensing images which provide rapid and inexpensive geologic information of extended areas, and which are extremely important for planning geologic prospecting and exploration projects.

The data obtained by means of remote sensing techniques is studied based on the convergence principle, according to which the interpreter starts with an overall small scale image (from satellites or space ships), which he gradually focuses on the desired geologic objective, passing through increasingly larger scales to increasingly greater detail.

We then asked Eng Vajdea to show us some of the basic principles used in the geologic interpretation of remote sensing images, and if possible, to offer an example of the application of this method.

One of the most widely used elements in the geologic interpretation of remote sensing images, is the topographic relief resulting from the action of internal and external agents on the formation of existing geological features. In general, the topographic aspect of a region depends on its petrologic and structural composition, its initial climate and its duration, and the changes to which it was subjected subsequently.

Most of the relief formations are due to the erosion produced by atmospheric agents -- water, wind, ice -- which have acted on the crust. Special configurations appear as a result of the disolving action of water on exposed rocks, or of the displacement of the magma in the crust and toward the surface in the form of volcanic eruptions. Other configurations are generated directly by the action of tectonic forces.

The action of the earth's internal and external agents on various types of rocks differs as a function of their petrographic nature, structure, texture, and spatial relationships, the modifications which are produced being reflected in simple or stereoscopic remote sensing images as more or less distinct specific traits.

One particularly important trait in the interpretation process, is the draining network of meteoric water. The draining system of a region is controlled by the slope of the surface, and by the type and altitute of the foundation rocks. Remote sensing images show six main types of drainages, with three respective textures. Their identification in these images can provide valuable information on the lithology and geologic structure of the region under study.

For instance, dendritic drainage networks indicate the presence of homogeneous and uniform rocks (sedimentary, volcanic tufts, thin glacial moraines, and so on); annular (circular) drainage testifies to the existence of rocks insinuated in fractures (granitic domes or salt massifs, and so on); and rectangular drainages correspond to such rocks as sandstones, crystalline schists, gneiss, which are affected by numerous faults.

And here are two examples of the application of remote sensing in geologic sciences. One of them is the geologic interpretation of a satellite image of Colorado (USA) in the Rocky Mountains, which has a number of known mining districts. From the image recorded in the 0.8-1.1 microns (near-infrared),

and considering the fact that most ore deposits are located in the immediate vicinity of intrusive bodies, primarily at nodal points of fractures, it was possible to delineate a number of probable zones -- some of which were already known from previous mining exploration and exploitation projects.

Research in the use of satellite images for solving geological problems is conducted at IGG in Bucharest.

Another example of geologic mapping is given in the cover photograph, which shows a color composite satellite image obtained by superimposing the 0.4-0.5, 0.5-0.6, and 0.8-1.1 micron bands, at a scale of 1:1,000,000, on the southern portion of Banat. By correlating this image with the geologic data obtained from projects conducted on the land, it was possible to obtain useful information regarding the assumed extent of certain fractures and the geologic limits of this region. A much more sophisticated processing of this region's satellite images, using electro-optic installations, has provided images whose analysis has yielded new geologic details about the region.

Remote sensing has found important applications in hydrology, a domain which is very significant to our country's economy. Diana Rosca, of the Meteorologic Institute, was kind enough to answer our questions regarding the extent to which remote sensing is better than classical methods in her studies, and about the achievements which have been obtained so far and are proposed for the future.

In the complex preparation of hydrographic basins, our institute's tasks are to formulate the hydrologic basis needed to work on waterways. The application of remote sensing techniques opens a new avenue in the study of surface water, providing such major advantages as simultaneous collection of vast data over large areas, successive recordings at short time intervals, and approaches to features which are unobtainable or very costly to obtain by other methods.

Using remote sensing images, our collective has attacked problems associated with the inventory of water reserves and the condition of the hydrographic network, documenting characteristic elements and their change with time (major beds, the formation of beds, terraces, slopes, zones which supply alluviums, concentration of alluviums, silting, the mechanism of formation of the Danube Delta, and so on). It was thus possible to very accurately define the major bed and characteristics of a section of the Birlad River, as well as the water volume at the high flood of July 1975; to document the phases in the evolution of the Danube Delta and of Sacalin Island; to study the submerged sand banks north of Sf. Gheorghe; and to investigate the river bank changes and silting in the Bicaz and Vidraru reservoirs. In addition, it was possible to rapidly determine the distribution of alluvium concentration along the coast at different periods. The time and materials efforts required for these projects represented only 10 percent of those which would have been required for traditional methods.

In the future, we propose to expand our research into hydrographic basins, and into other areas such as monitoring flood crests, preventing flood risks, monitoring ecological changes resulting from erosion, indicating zones of maximum erosion and zones for locating anti-erosion projects which will prevent silting in reservoirs and land degradation, and establishing flow coefficients. In 1978, we expect to finish a map of the Danube Delta and of the coast, whose elements will describe their transformation as a function of hydrologic conditions.

Dr Spiridon Blidaru and Dr Constantin Moissiu, who are also at the Meteorologic Institute, indicated that remote sensing can also be used to determine the water reserves contained in snow packs, as well as the flows and maximum volumes of water during the melting period, thus providing a hydrologic basis for the steps taken to prevent and combat floods. Remote sensing will also help to optimize, plan, and exploit reservoirs for hydroelectric power, agroindustrial uses, and urban needs. In addition, it will assure a continuous flow of information about the characteristics of the snow pack during its formation and melting, making it possible to provide users (in agriculture, road and railway transportation, forestry, constructions, city and village water suppliers, tourism, and so on) with the most recently obtained data. But the greatest theoretical and practical advantage of remote sensing is the formulation of an operational method for evaluating at any given moment the water reserves contained in the snow pack throughout the country, by interpreting and exploiting satellite recordings.

In order to apply this method to research in levels of snow packs, a sample zone was selected for the time being, delimited on the north by the Southern Carpathians (between the Negoiul and Ciucas peaks), on the south by the 45th North Parallel, on the west by the Topolog River, and on the east by the Telejean River. This large perimeter includes the basins of the rivers Topolog, Arges, Valsan, Doamnei, Tirgului, Argesel, Ialomita, Prahova, Doftana, and Telejean. The potential beneficiaries are eight lakes, the most important of which are Vidraru on the Arges, Scropoasa on the Ialomita, and Paltinu on the Doftana.

Continuing our interview, Dr Horia Grumazescu told us that the Laboratory of the Institute of Meteorology and Hydrology, which specializes in this field, has initiated and conducted since 1974, a study regarding the possibility of using remote sensing techniques for identifying and evaluating sub-soil water.

The selected sampling area was the experimental hydrogeologic station Cilibia, located between the Buzau River on the north and the Calmatui River on the south, covering an area of about 250 square kilometers. This territory was chosen because the periodic observations and measurements made over a relatively long number of years provided a better knowledge of the sub-soil water in this part of the Romanian Plain; as well as because the land located between the Buzau and Calmatui plains composed a zone suitable for such testing, given the relative shallowness of the sub-soil water table and the surface manifestations of the physical and chemical properties of this water.

This test made it possible to specify the volume and nature of the information which can be obtained through remote sensing, and the accuracy of this information. It was possible to accurately identify and evaluate the sub-soil water in the sample zone. By establishing "keys" for the interpretation of satellite images, in 1976 a program was started to identify and evaluate the sub-soil water in the alluvial plain of the Siret River, which is of great agricultural and hydrotechnologic interest.

In the years to follow, the application of remote sensing techniques will be expanded to the identification and evaluation of sub-soil water in plains covered with macroporous and sandy deposits.

11,023
CSO: 2702

RESEARCH AIMS AT IMPROVED SOIL, CROPS

Bucharest STIINTA SI TEHNICA in Romanian No 3, Mar 77 pp 19-20

[Article by Academician Nichifor Ceapoiu, director of the Research Institute for Grains and Industrial Crops: "Production Beyond Biological Limits"]

[Text] The plant varieties and hybrids being cultivated today yield much higher productions than those obtained only a few years ago. Average productions per hectare of 3000-4000 kg of wheat, or 7000-10,000 kg of corn over extensive areas have become commonplace. At the Fundulea Research Institute for Grains and Industrial Crops (ICCPT), we have created wheat varieties which yield even higher productions, of 8000-10,000 kg/hectare. Remembering that specialists estimated the maximum biologic potential of wheat to be 8000 kg/hectare, this means that these varieties of wheat exceed the biological limit by a significant amount. For corn, sunflower, sugar beet, and other crops as well, the productions obtained in recent years are close to what are considered their biological limits (over 27,000 kg/hectare for corn, and 120,000 kg/hectare for sugar beet). These harvests are based on the outstanding progress made in genetics and plant improvement, and on the modern agricultural technology which enables the newly created plant varieties and hybrids to fully manifest their productive capabilities and their biologic potential.

In undertaking the creation of a new plant variety or hybrid, we seek a number of goals: high productivity, precocity, protein or oil content, quality (such as ability to make bread), resistance to diseases and pests, resistance to unfavorable environmental conditions (frost, drought), ecologic adaptability, and so on. And not to be overlooked, we need an intuition and creative imagination which enables us to define the plant model which we want to obtain so that it will correspond to the future needs of mankind. It might be said that this projection into the future makes plant improvement a true art. Depending on the objectives which have been defined, the procedures for the genetic transformation of plants, and for the multiplication of high quality varieties or hybrids, bring into play all the scientific resources of genetics. It becomes a matter of introducing new genes and of regrouping them in the genetic formation of the plant so that they will best express the desired attributes.

Boldly using the possibilities created by discoveries in genetics throughout the world, workers on plant improvement have obtained remarkable successes. The newly created plant forms have spectacularly exceeded traditional production levels, proving that the so-called biological limits can be surpassed.

High Productivity Varieties Rich in Protein

In Romania, the results in the field of plant improvement have registered a qualitative jump, assuming values comparable to those of world renown.

For instance, the wheat varieties Dacia, Ceres, Iulia, and Diana, created at ICCPT-Fundulea, achieve productions of up to 6500 kg/hectare on unirrigated land, and the early wheat variety Ileana, short and very resistant to falling, yields irrigated crops of more than 7000-7500 kg/hectare. Similarly, the production potential of the wheat varieties Lovrin-10, Lovrin-13, and Lovrin-231, created at the Lovrin Agricultural Research Station, reaches 7000 kg/hectare without irrigation, and 8300 kg/hectare when irrigated, in fertile soil and with good agricultural technology.

The wheat varieties Turda-195 and Silvana, created at the Turda Agricultural Research Station, are characterized by productions of 4000-5000 kg/hectare. They yield good results in Transylvania, on slopes and on land which has been eroded often and is poor in fertilizing substances.

One of the concerns of Romanian plant researchers is to improve the protein content of wheat grains by increasing their lysine content. A remarkable achievement of our institute in this respect is the variety of wheat Carmen, characterized by three important attributes: high protein content (18 percent), high precocity, and very good bread making quality. The Carmen variety is equal to the foreign varieties with the highest protein content (Atlas-66, Klein Atlas, Fontezuela), but is superior to them in its production potential (4000-4700 kg/hectare), its adaptability to our country's ecological conditions, its precocity, and the better quality of its gluten. Being rich in protein matter, the grains of this variety can also be successfully used for animal feed.

Valuable varieties, Intensiv-2 and Miraj, have also been created for barley. The Miraj variety is a typical autumn barley, short (80-85 cm), very early, and with a production capability of 8000-10,000 kg/hectare in irrigated planting, which is unequaled by other barley varieties. It is very resistant to flying blight and to brown rust. Also notable are the two-row barley varieties Azuga and Gloria, the first autumn varieties to be introduced as crops; they have good properties for beer making, and are adapted to the rugged climate of the south of the country, where spring two-row barley does not succeed. They yield productions of 4000-5000 kg/hectare, superior to those of spring two-row barley.

For rice, we have developed the early varieties Sidef and Danubiu; these are the first varieties with a strong, short straw, resistant to falling, created in Romania, and which make very good use of fertilizers while lending themselves to mechanical harvesting.

For corn, we have created and placed in production several hybrids which cover a very broad range of growth periods and production capabilities. Among them are the HD 96 hybrid, typical of a second crop, which can produce between 5000 and 9000 kg/hectare with superior agricultural technology; the semi-early HS 230 hybrid with a production capability of 5500-10,500 kg/hectare without irrigation, and 7500-1200 kg/hectare with irrigation; the HD 305 hybrid, which is also semi-late, with a growth period of 135-140 days, and which produces 5000-10,800 kg/hectare with irrigation; and the HS 335 hybrid, which is the first Romanian corn hybrid rich in essential amino acids (lysine and tryptophan) obtained by transferring the opague 2 gene into the parental lines of the simple, normal 330 hybrid. The 335 hybrid is successfully used for animal feed, producing significant weight increases.

By using some foreign sources of genes for precocity, we have created very early corn hybrids suitable for the cold and humid zones of the north of the country, and for sub-carpathian zones. As an example, the Suceava Agricultural Research Station has created the HD Suceava 90 corn hybrid, which is the earliest corn hybrid obtained in Romania. It has a growth period of 110-115 days, and a production capability of 5000-8000 kg/hectare.

Valuable varieties and hybrids have also been obtained for other agricultural crops, such as sorghum, peas, field beans, soy bean, chick peas, and others.

For instance, by creating the Flora and Violeta varieties of soy bean, we contributed to the promotion of this crop in Romania. These varieties have growth periods of 115-140 days and produce 3500-4500 kg/hectare; their grains contain 35-40 percent protein and 20-25 percent oil.

An outstanding achievement at ICCPT-Fundulea has been the creation of the first sunflower hybrids based on monogenic nuclear androsterility with genetic marking for androfertility. These are the simple hybrids Romsun-52 and Romsun-53, which are exported to several countries; their seeds contain 50-51 percent oil, and they produce 3200-4000 kg/hectare. Being rich in linoleic acid, they are very valuable for nutrition.

Other remarkable sunflower hybrids are Romsun-90, an early hybrid, and Romsun-301, a semi-early hybrid. Romsun-90 can be grown in colder zones, or as a second crop if irrigation is used. Recently, we transferred the Pl_1 gene into the parental lines of these hybrids, in order to impart resistance to the European strain of sunflower blight, obtaining new hybrids resistant to this disease which is ravaging sunflower crops.

Among the latter, we have the simple hybrid Sorem-80, produced on the basis of cytoplasmic androsterility and restoration of polen fertility. This is a semi-late hybrid with an oil content of 50.5-51.5 percent and a large production capability (3500-4000 kg of seed and 1500-2100 kg of oil per hectare). It was adopted in 1976, and is recommended for all blight-infected regions as well as for irrigated crops.

Significant results were also obtained in improving castor-oil plants, linseed-oil flax, and fodder plants. By using primarily local sources of germoplasma, we have created productive varieties with high production capabilities, readily adaptable to perennial and annual leguminous plants and to perennial gramineous plants.

Priorities in Production Support

The attributes of the varieties and hybrids created by our institute are close to the biological limits, and in some cases even exceed the properties of crops known in our country until now. Is it biologically possible to create more productive varieties and hybrids? That is certain. During the five-year plan of the technical and scientific revolution we have proposed to make available to our agriculture varieties and hybrids with a production potential higher than the current one: for wheat, 6000-8000 kg/hectare in non-irrigated crops, and 8000-10,000 kg/hectare for irrigated ones; for corn, 10,000-12,000 kg/hectare in traditional crops, and 15,000-20,000 kg/hectare with irrigation. At the same time, quality will become the defining element of the value of new varieties and hybrids. The research priorities will be assigned to more protein, and in particular to superior protein, as well as to the attributes which are most fitting for the use of the products.

Our attention is directed toward the creation of wheat varieties with shorter stems, resistant to falling, and with better ability to use fertilizers, thus more productive. We have also set a goal of 16-18 percent protein content in wheat grain, an attribute which will be combined with the other elements which determine the quality of bread and flour products. Together with Triticale, which is currently being worked on, protein-rich (16-17 percent) fodder wheat with a high production potential will contribute to the development of the fodder base in our country.

Stability and better adaptability to our country's conditions will become genetic properties of the new varieties. Their genetic program will include such attributes as improved resistance to winter and drought, and especially an outstanding resistance to diseases.

The plant testing installation recently placed in operation provides excellent conditions for investigating the resistance to disease and unfavorable conditions of the new varieties and hybrids, as well as the shortening of their growth periods.

For corn, research will continue for obtaining very early hybrids for hilly and pre-mountainous terrain; specialized hybrids for two crops, sufficiently early to produce grain, and resistant to pathogens specific to their respective periods; hybrids rich in essential amino acids; corn with two cobs, a property which provides high ecologic adaptability, and which results in constantly large productions, even under adverse conditions.

For sunflowers, we will continue to work toward the creation of new hybrids of high quality, with absolute resistance to blight and improved resistance to other diseases (white mildew, gray mildew, black spotting, broom rape). The production potential of the new hybrids will be increased to 4500 kg of seed per hectare, with an oil content of 53 percent. In parallel, we will improve the quality of the oil by enriching it in linoleic acid.

We will continue to improve and increase the production potential, the resistance to disease, and the quality of other grains (barley, rice, sorghum), as well as that of leguminous plants, fodder, flax, and so on.

For soy beans, a plant with an extensive future in Romanian agriculture, the research will continue to attack a problem with outstanding applications. Some of the studies will concern the transfer of some genes into valuable lines, for higher protein content (49-69 percent), resistance to disease, prolificness (5-7 pods per node with 4-5 grains per pod), and compact inflorescence. Efforts will be made to transfer into valuable genotypes the gene for cytoplasmic androsterility (ms_1).

We will also continue theoretical research in genetics, physiology, ecology, phytopathology, and entomology, all of which will enable us to improve our methods, shorten the duration of studies, and rapidly provide production with new varieties and hybrids of high productivity.

11,023
CSO: 2702

COMPUTER-BASED CROP IRRIGATION PROGRAM DESCRIBED

Bucharest STIINTA SI TEHNICA in Romanian No 4, Apr 77 pp 8-9

/Article by Dr Engr Ioan C. Paltineanu/

/Text/ Water, an essential factor of the development of life on our planet, is now one of the major topics of research in many scientific centers of the world. Principally, the quantitative and qualitative evaluation of water, of the present and future resources of our planet as a whole, and its geographical and especially demographic distribution are of outstanding importance to the ensuring of the food for the continuously growing world population.

The estimation of the water resources of our planet indicates that out of the total 1.5 billion cu km of water, 93.7 percent occurs in oceans and seas, 2.1 percent is immobilized in ice-caps and mountain glaciers, and the remaining 4.2 percent occurs in rivers, subsoil waters, lakes, and so on.

It is clear that the reserves of fresh water are small, some of them debouch in oceans without being used, and many of them are immobilized in ice-caps and mountain glaciers. If we add the various types of pollution, the reserves shrink even more. That is why Prof Furon, of the Sorbonne, states that the 20,000 cu km of fresh water annually available on the earth surface will not be sufficient to meet the needs of the 20 billion inhabitants, the figure which is estimated in terms of the population for the year 2100. In order to cope with the situation we must efficiently use the existing water.

Farming on irrigated areas (200 million ha in the world) is one of the major users of fresh water. In most cases, the irrigation systems use water with an average efficiency of 50 percent. Hence, it is absolutely necessary to make efforts to use irrigation water with the highest possible efficiency.

The scientific advances in the matter of establishing the interrelations in the soil-water-plant-climate system have permitted

the more precise estimation of the evapotranspiration of crops, the efficiency in the area of applying the irrigation water on the land, and the involvement of precipitations in the plants' use of water. The experts developed mathematical relations which are capable of more accurately describing each individual phenomenon and the interrelations. On the basis of existing knowledge, the experts switched to the stage involving the prognostication of the data on the application and on the quantity of water which must be given every crop at the level of a lot, farm, and the whole irrigation system. These studies, which were started in the last 5-10 years, are being conducted in the United States, France, and other countries.

In the United States, research has resulted in the working out of a computer-based program for crop irrigation. The program was officially approved by the Department of Agriculture.

At the Federal Center in Denver, Colorado, the program is run on a giant computer, Control Data Cyber 74, which calculated the data from 20 irrigation systems. After the first years of using the program, output increased 16 percent and water loss as a result of runoff on the surface of the soil and percolation under the radicular zone dropped from 20-40 percent to 10 percent and coincided with the reduction of the nitrogen applications for various crops. The program combines the need for water in the field with the delivery prospects of the irrigation system and weekly sends the data to each farmer in the area under the survey.

In Romania, a group of young researchers composed of Dr Engr Ioan C. Paltineanu and Dr Engr Rodica Paltineanu, of the Laboratory for Irrigation Technique of the Fundulea Research Institute for Grain and Industrial Crops, and mathematicians Ruxandra Marincovici, of the Faculty for Land Improvement of the Bucharest "N. Balcescu" Agricultural Institute, and M. Ionescu-Bujor, of the Bucharest University, began studies for working out a computer-based program for crop irrigation as far back as in 1971.

The PIRAT program (Computer-Based Crop Irrigation Program) for planning in crop irrigation uses data from the farm, the experimental station and the center of the irrigation system in light of the local factors (climatic data, evaporation on the water surface, lysimeters).

The programming language is Fortran. The program can be run on computer types FELIX C 256, IRIS 50, IBM/360, IBM/370, and DACIC existing in our country.

The program includes one principal program (MAIN), three subprograms (VAPOR, PRINT, and FARMS) and one function (POL 3).

It involves determining the water deficit in the soil on the basis of the components of a balance in conformance with the number of days until the next irrigation, the amount of water which must be applied on the land for each crop and for each lot on a certain farm.

The mathematical model indicates that the soil is considered as a reservoir which accumulates water from precipitations (Pe), irrigations (I) and which loses water as a result of evapotranspiration (Et) and drainage under the radicular zone (Wd) in a certain period of time (I = 1,2,3.... n days).

When the reservoir is half empty (D = Do), the program plans a new irrigation which will fill the reservoir (D = o).

The main program serves to introduce the data on: the code and the designation of the irrigation system; the number of days on which the calculus is based and the data on the beginning of the calculus; indicator on the manner in which the calculus on real evapotranspiration is made (on the basis of the Penman formula, by reading on lysimeters or at water evaporation basins); climatic data (when evapotranspiration is computed on the basis of the Penman formula), respectively the values of evapotranspiration of crops in lysimeters or evaporation basins (if these methods for computing evapotranspiration are adopted).

The VAPOR subprogram serves to determine the values of daily evapotranspiration for the period of computation. It is called by the main program only when the Penman formula for computing potential evapotranspiration is used. In essence, the determination of the values of potential evapotranspiration by the Penman formula was based on an exponential curve determined on the basis of a set of values collected during the 1968-1972 period for the area corresponding to the Fundulea Research Institute for Grain and Industrial Crops.

In order to calculate potential evapotranspiration on the basis of the Penman formula it is necessary to record the daily global solar radiation ($cal/cm^2/day$), the maximum and minimum air temperature and wind velocity. The data on global solar radiation may be used for an extensive area of several tens of kilometers around the observation station.

The PRINT subprogram serves to print the daily values of potential evapotranspiration corresponding to the area for which the calculus is made and the indicated period of calculation.

The FARMS subprogram is aimed at calculating for each crop, on the level of each farm, the following elements: the values of the actual evapotranspiration of each crop, of the number of days until the next irrigation and of the amount of water which must be applied

on the ground. The calculation of the actual evapotranspiration is based on potential evapotranspiration and a coefficient depending on the crop, in light of the progress in vegetation of the crop involved.

The crop dependent coefficient was determined for corn (kernels) on the basis of a cubic polynomial whose coefficients were determined statistically on the basis of the data collected at the Fundulea Research Institute for Grain and Industrial Crops during the 1968-1972 period.

The coefficients of the approximation polynomial and the mode of determining the crop coefficient are dependent variables of the period from sowing to earing and the period from earing to harvesting.

The subprogram which is a dependent variable of POL 3 includes the cubic approximation polynomial, which serves to determine the coefficient which is a dependent variable of the crop. 20.

The testing on the field of the irrigation technique laboratory of the Fundulea Research Institute for Grain and Industrial Crops focusing on the irrigation of corn (kernels) during the 1973-1976 period demonstrated that between the estimate of the date of irrigation weekly calculated with the PIRAT program and the one conventionally determined on the basis of the balance of water in the soil there are no great differences.

Hence, the use of the program and the supplementing of information with the determination of soil moisture at the beginning of the irrigation season can result in the replacement of the conventional painstaking and costly method of periodically determining the humidity of the soil.

The PIRAT program for planning crop irrigation on the basis of the interrelations in the soil-water-plant-climate system can help the expert in decision-making on the time and amount of water to be applied on the field for a particular crop and a particular field in rotation, weekly providing the required information.

The program is devised so that it may determine the evapotranspiration in light of local factors: potential evapotranspiration (Penman), evaporation at the surface of water and evapotranspiration determined in lysimeters to which locally estimated coefficients, which are crop dependent variables, are applied.

The flow of information in the current organization in this country may be: the input data supplied by the farm and the experimental station reach the system center where they are processed and subsequently sent to the territorial computer center which covers the

area involved. The results obtained are reported to the system center which supplies them either to the user (at the weekly meeting) or by telephone-telex.

The utilization of the program offers the following main advantages: the use of a minimum number of input data; the constant estimation of the water shortage; rapid updating of data on the basis of control over soil moisture; great, prompt processing capacity and accuracy for a large amount of data on crops, lots, farms and production units; considerable reduction of manpower utilized to determine the humidity of the soil in the field; and provision of the results to the farmer in a simple and easily interpretable form.

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CSO: 2702

NEW DEVELOPMENTS IN ELECTROGRAPHIC TECHNIQUES OUTLINED

Bucharest STIINTA SI TEHNICA in Romanian No 4, Apr 77 pp 28-29

/Article by Dr Ioan Florin Dumitrescu/

/Text/ Electrography is a vast area of investigation of physical bodies by means of electric current. In contradistinction to electrical measurements which translate the studied characteristics into numerical values, the electrographic procedures transfer in significant and reproducible pictures electric or nonelectric characteristics, conveyed by an electrical value which represents them (transduction).

Electrography was erroneously considered as an area of exploration exclusively by means of very high voltage currents. One may also obtain electrographic effects at low voltage by means of extremely sensitive sensors which reproduce the changes created by interposed bodies. Electrography has longbeen used in high-voltage technique. The reproduction of the effects of high-voltage sources was known as klydonography and was performed for the first time by Lichtenberg in 1777.

The use of electrographic pictures in the electric exploration of living organisms, although mentioned in literature as experimental as early as at the end of the last century, drew the attention of research workers only in recent years.

Electrography aroused tremendous scientific interest as a result of the progress induced by the Kirlian photographic technique. This accounts for the fact that many authors mistake electrography for electroluminescence photography by means of high frequency currents known as Kirlian photography.

Below we shall list the main effects which underlie the various electrographic methods and techniques with their variants which we know: 1. The ponderomotor effect; 2. The electroluminescence effect; 3. The electrostatic polarization effect; 4. The blocking effect of the light secondary emission; 5. The thermoelectric effect.

The systematic study of these effects and their use in the biological field have resulted in the development of unique techniques for electrically investigating living organisms.

Electrography based on the ponderomotor effect utilizes the action of orientation and space movement of some microparticles induced by their collision with an oriented flow of secondary electrons or ions, derived from the electron impacts with atoms and molecules in the gaseous medium in which they occur. It provided the first Lichtenberg pictures as a result of the disintegration of neutral microparticles under the action of high voltage electric current.

Subsequently, the use of the ponderomotor effect, of very high-voltage discharges, was replaced by a technique of photographically recording the electroluminescence effect. The pictures became a similar arrangement of the discharge lines.

We utilized this electrographic technique to figure lines of force of living organisms under the conditions of being subjected to various voltage levels and the connection with the effect exerted by the electromagnetic fields of the living organism.

The ponderomotor effect is dependent not only on the characteristics of the voltage source and of the organism investigated but also on factors connected with the microparticle subjected to migration (size, specific weight, arrangement of the electrostatic charges on its surface, hydrophily, and so on) and electric factors in the medium in which migration occurs (temperature, moisture, ion concentration with the gradients involved in the sense of migration, and so on).

Biological electrography may be developed in all the systems of electric current provided that the harmful parameters are limited to the values of biological tolerance. The graphic effects of the method involve the reproduction of lines of force oriented in the proximity of the living structure which figure the interrelations between them and the outside electric medium.

Electroluminescence electrography is based on the effect of luminescent ionization at the level of the separation of two different electric media.

The utilization of electroluminescence in biological exploration is the credit of Judcko Narkiewich (1898), Navratil (1910) and S.D. Kirlian (1939) who explored living organisms by means of currents of figh frequency and at very high voltage.

Four variants of this technique are known.

A. The Kirlian photography is the method which has asserted biological electrographic exploration in the scientific world. It utilizes the exploration of living organisms in electromagnetic fields generated by radiofrequency and very high voltage electric currents. The picture is produced by the appearance of ionization microchannels in the dielectric space which contains the light sensor at the limit of separation of the biological electric medium with the external electric medium. Relatively homogenous discharges, like the superposed pelicular effect (marginal aura) develops around the exposed organism. The presence of the ionization channels conveys the existence of zones of minimum electric resistance in the medium adjoining the organism (proximal electric medium) and inside it.

B. Electronography involves a variant of electroluminescence electrography under the conditions of the transfer media of the electron flow being compact. The propagation of the electron flow proceeds in one direction and only once (unique impulse). Electronography, which is a unique Romanian method (Dumitrescu et al., 1975) is characterized by three essential elements: the quantification of the electron emission; the differentiation of the electromagnetic field created; the differentiated scintillation with the determination of the power level of the particles accelerated by their conversion into a proportional luminous flow.

The electronographic technique uses unique impulses with controlled polarity, amplitude, rise slope and energy. The voltages are of the order of voltages which generate the "explosive potential" under the conditions of the impedance of the electric circuit used.

The electronographic picture is characterized by three distinctive aspects which may prevail among them, depending on the technique selected.

a. The pelicular aspect or the aspect of fundamental marginal discharge is one which, developing on a successive basis, just as in the Kirlian technique, may generate the characteristic aura.

b. The electromorphic aspect generated by the distribution of the electromagnetic field of the very high voltage impulse inside the volume-conductor represented by the living organism.

c. Aspects of the proximal electric medium (layer of adherent aeroions, free aeroions, and other luminous emissions).

C. Microelectronography, obtaining of pictures by electroluminescence at the cellular level, was performed for the first time in 1975 (Dumitrescu, Portocala, Herivan). The microelectronographic technique, far more intricate than the electrographic technique, involves exposing a biological preparation in monocellular layer in an electromagnetic field generated by sets of impulses at a level of critical amplitude.

Electroluminescence at the cellular level is recorded by a photosensitive emulsion or by a photosensor. It is then enlarged, examined and memorized by optical or electronoptical devices. The microelectronographic picture is obtained in the black-and-white technique, the natural color technique, or converted into conventional colors to enhance the contrast. The method is applicable in the cellular, tissular or genetic studies.

D. Electroluminescence spectrography, also, is a unique Romanian method which involves the analysis of the light emission with a system of sensors with a sensitivity limited to spectral zones with complementary wave lengths.

Such a spectrograph was recently developed within the framework of the Center for Labor Safety and Hygiene under the Ministry of the Chemical Industry.

Electrography based on the electrostatic polarization effect uses the effect of electrostatic loading of some dielectric and semiconductor materials, which secondarily add microgranular pigment which is discharged on a support with optimal contrast. The method was tested and reported in 1975 (Dumitrescu and Celan). The source of very high voltage generates unique and monopolar impulses, identically to the electronographic technique.

The electrographic principle based on electrostatic loading was used in reproducing the electrographic picture.

Electrography based on the effect of blocking the secondary light emission. The blocking of the stimulated light emission by a flow of electrons is a phenomenon which was recently observed (Dumitrescu, 1976), opposed to the light emission which occurs in the electroluminescent discharges.

The method uses the darkening of a phosphorescent screen which was previously excited by light or another factor, in the areas in which a flow of electrons generated by the living organism bombard the excited screen. The picture of "darkness" reproduces, the same as the electroluminescent picture, the electric characteristics of the living organism and is capable of detecting anomalies of distribution through the zone with various luminescences.

Electrography based on the thermal effect utilizes the thermal effect of high voltage discharges in the living organism and thus provides another prospect for the electric investigation of this organism.

The high voltage discharges are recorded by a special thermographic device, by means of a layer of liquid crystals with calibrated chromatic toning or captured by a thermovision circuit. This prospect of electrographic exploration was recently tested by us. It provides a method which differs in terms of concept and effect from the known technique of the Kirlian photography.

Electrography asserts itself as a genuinely modern scientific field with vast prospects in the exploration of living organisms and especially the human organism.

We feel very strongly that the electrographic principles set forth will generate many variants in the future, the same as electronography originates from high frequency photography.

We consider, however, that among all the methods which we have tested so far, electronography has provided the most surprising results which have prospects of immediate utilization.

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CSO: 2702

IMPORTANCE OF RESEARCH IN TRIBOLOGY EMPHASIZED

Bucharest CONSTRUCTIA DE MASINI in Romanian No 12, Dec 76 pp 581-584

[Article by Prof Gh. Manea, corresponding member of the Romanian Academy]

[Text] Man's interest in problems involving friction, lubrication, and wear is growing together with the development of technology, industry, and the consumption society. Friction-wear phenomena result in enormous losses, represented by a consumption of energy and materials determined by interruptions in operations and by the effort required to replace worn parts or assemblies. The result of proper planning, techniques, and maintenance is a higher machine yield, and a longer operation through reduced wear, all of them leading to considerable annual savings (according to Western experts, of the order of 0.5-2 percent of the annual national income).

A remarkable effort of scientific research is being conducted abroad and here to learn and master the very complex and difficult to solve problems of friction, lubrication, and wear. Similarly important is the contribution of this research in the machine building field -- quality improvements, reliability, and durability -- in the great modern achievements -- aerospace industry, nuclear installations, computers -- and in obtaining better quality materials and lubricants for conventional operating conditions as well as for supporting unusual operating conditions imposed by advanced constructions.

In a strict sense, tribology means the science of friction. In a broader sense, it represents the branch of science and technology which includes all phenomena of friction, wear, and lubrication, including the construction, technology, and use of surfaces which come in contact with each other, with relative motion, and with mutual interaction.

With this in mind, tribology is no longer limited to the reduction of friction by lubrication of machine parts, or to the use of friction in couplings, brakes, self-locking screws, and so on; it now covers an extremely broad field regarding basic phenomenology, construction, technology, and utilization in all sub-branches of machine building: machine-tools, power or labor saving

machines, metallurgical machines, mining and drilling machines, transportation machines, agricultural machines, construction machines, textile machines, precision machines, and so on. The friction and wear processes which arise during lamination between cylinders or wire drawing, during rolling and braking of bands on rails or tires on road surfaces, during drilling and crushing, or during the operation of agricultural machinery in the field, are only some of the examples in which fundamental and applied scientific research is making and still has to make an important contribution.

Together with this, in order to reduce friction and prevent and decrease the destructive effects of wear, scientific research has also been oriented toward the formulation of new materials and alloys, new techniques, and new lubricants and suitable additives, calling extensively on synthesis, and on laboratory and field tests with operating assemblies. Tribology has become an integral part of design.

In Romania, scientific research in friction, lubrication, and wear is far from being new; research schools in this domain have existed even before the brach of science defined above acquired the label of tribology. They have achieved valuable results respected here and abroad, some of them being the first of their kind.

At the Bucharest Polytechnic Institute, the phenomenology of friction, lubrication, and wear, as well as calculation methods for hydrodynamic bearings, have been taught since 1945, while simultaneously, fundamental scientific research in this field has been carried out at the Institute for Applied Mechanics of the Romanian Academy -- and subsequently at the Center for the Mechanics of Solids -- at INCREST (Institute for Scientific and Technical Creativity), and in the higher technical education. The use of plastic materials for bushings, which undergo significant local deformations under pressure, has also oriented the research toward elasto-hydrodynamic phenomena.

In recent years, solutions have been found for determining pressures, flows, and the rigidity of hydrostatic bearings without longitudinal flow channels, and computer programs have been written for these solutions. In addition, investigations have been made into the tribologic processes involved in the operation of metal and plastic gears.

Internationally highly regarded research has been conducted on gas lubrication (calculation methods for gas bearings, influence of the molecular nature of the motion and of inertia forces, stability, magneto-gas-dynamic lubrication, and so on). Valuable original contributions have been made to the field of lubrication under turbulent conditions. Research is currently being done on transition states in bearings, And studies have been carried out on advanced bearings.

The introduction and development of ball-bearing manufacturing in Romania was supported by extensive domestic scientific research into the relationship between wear, the shape of rolling bodies, and the nature of lubrication.

Parallel research has been carried out into dry and limiting friction, intermittent motion, and the frictional properties of thin films. Using Romanian-built instrumentation and statistical calculations, quantitative estimates of wear have been made with high reproducibility.

With regard to material couples, the research has covered the influence exerted by the nature of the materials and processing techniques on friction and wear during operation, and on calculation parameters, usind various combinations of materials -- metallic and non-metallic -- thin films, and different surface treatments. Emphasis has been placed on plastics and on the influence of their chemical composition, their structure following processing, their mechanical and physical characteristics, their limits, and the effect of additives.

Of equal importance to Romania are the studies which have been and are being conducted on lubricants and additives: lubricant behavior and viscosity at high pressures; mechanism of additive action; influence of the addition of graphite and molybdenum disulfide on bearings and gears; and formulation of new additives and lubricants.

In addition to their contribution to its contribution to science, most of this research has found practical applications. As further recognition of its research activities, Romania has been accepted as founding member of the International Commission on Tribology. During the Fourth Conference on Mechanics, organized by the Romanian Academy, the Ministry of Education and Instruction, and the Ministry of the Machine Building Industry on 18-20 December 1975, the papers referring to friction, lubrication, and wear were presented for the first time in a separate section devoted to tribology. This provides a measure of the attention devoted to this -- relatively new -- branch, and to the activity which Romania is conducting in tribology problems.

The papers entered in the program of the tribology section covered studies and calculation methods for friction and wear, bearing lubrication, lubricants, and for the behavior under friction and wear, of materials and alloys used in friction couples. Although the number of papers does not quantitatively reflect the effective research projects being conducted in Romania, their content did show the scope of the investigations and the high level at which this field is being treated. Their topics, of immediate or near term interest for our country's production, demonstrate the current knowledge of advanced achievements throughout the world, as well as a mastery of modern methods for handling them. Great progress has been observed in the blending of analytic investigations with experimental studies; at the same time, convincing proof was offered of the manner in which fundamental research can directly affect production.

During the new five-year plan which has just begun, the five-year plan of the affirmation of the technico-scientific revolution in our country, researchers in tribology have assumed greater and extremely important tasks for providing new and advanced products and technologies, and for improving existing ones, so that they will satisfy the demand of the national economy and be competitive on international markets. In addition, decisive action must be taken to apply the results of this research in order to obtain savings in designing, manufacturing, and operating mechanical equipment, a direction in which it has already been stated, vast possibilities still exist.

Through research focused on major, high priority goals, according to the Directives of the 11th Party Congress, tribology results can contribute extensively to:

Improving economic and construction indicators for machinery and systems;

Reducing metal consumption by means of rational design;

Using new materials appropriate for operation at the speeds, pressures, and temperatures required by current conditions and by future progress;

Increasing precision and reliability by means of correct calculations, both from a mastery of the phenomena involved, and by using automated control equipment;

Increasing durability -- within economic limits -- by decreasing wear;

Improving processing techniques and formulating new techniques which require modern machine-tools, new materials for tools and parts, intensive operating conditions, and specific technical lubricants.

Continuing research on the topic of slip bearings will respond to the need for high-revolution engines and machines. Of particular interest are bearings subjected to dynamic loads at high specific pressures.

The formulation of complete and comprehensive programs must offer our designers the possibility of optimizing the dimensions and construction of hydrodynamic and hydrostatic bearings, and for using readily deformable materials. The construction in Romania, of advanced machinery, and the development of bushing fabrication for slip bearings, implies -- as in the case of ball bearings -- long range studies not only of conventional bearings, but of unconventional ones as well, delving into their construction, lubrication, operating conditions, and environment.

The extension of theoretical and experimental research on aerostatic and aerodynamic supports beyond applications to correction spindles, can bring qualitative improvements to the construction of machines (machine-tools in particular).

Of interest to precision machines and to systems operating without particular supervision, are the self-lubricating porous bushings. Because the inter-dependence, which is difficult to establish, between the flow of lubricants stored in the pores of the bushing, and the lubrication processes in the film formed between the bushing and the shaft, as well as of the important effect of temperature, the phenomenology of the problem is far from being understood, not to mention the fact that a complete and correct analysis has yet to be made. In this case, flagrant contradictions exist between the hydrodynamic theory and experimental studies which deny the presence of such lubrication conditions.

Research is still needed in contacts of various types, and in thermo-elasto-hydrodynamic and structural questions, in order to learn the effects of real stresses, of real friction coefficients, of behavior under slip wear, of fatigue, of seizing, while considering the nature of materials, the quality of surfaces (roughness, corrugation, hardness), operating and environmental conditions, the nature and type of lubrication, and the lubrication conditions. Going beyond the field of bearings, the results of this research can be applied to gears, couplings, clutches, cams, control devices, pistons, cylinders, seals, rolls for metals, rubber, plastics, and so on.

Aerospace constructions, nuclear installation assemblies, the much greater speeds of land transportation, new applications (air cushions, for instance), undersea drilling, offer a broad field of study for tribology.

In the high-priority field of machine-tools, tribology problems involve not only the mechanisms of the machinery, but the actual action of the tool on the material with its processes of friction, deformation, chipping, thermal stress, and so on. In the processing zone, for severe cutting conditions, materials which are difficult to work, and for high quality surfaces, the cooling and lubricating fluids are extremely important for tool durability and productivity (allowing intensive operations and tool changes and adjustments at greater time intervals) with considerable economic effects.

Specialists in the field of tribology must devote greater attention to the construction and operation of agricultural machinery, both in terms of mechanical systems and parts, and in terms of cutting elements. In the first case, the wear is worsened by unusual demands and totally unfavorable environments (dust and humidity); in the second case, consideration must be given to the particular properties of the soil and of the plants which come in contact with cutting elements. Very large savings can be obtained by reducing wear in this domain.

Friction and wear also play a decisive role in the accuracy and durability of precision mechanisms -- a field which also has a high priority -- in instruments for weighing, for measuring various physical dimensions, in calculators, and in industrial timing mechanisms (which use specifically adapted parts and other parts), so that tribology research in this domain must also be given the same priority. There is room here for liquid and air lubrication, self-lubrication, and dry friction.

More research must be done on tribologic problems in other branches of the machine building industry, as indicated previously.

In the modern treatment of difficult problems in friction, lubrication, and wear, closer approximations to reality can be obtained through the mathematical modelling of processes and through statistical methods in quantitative analysis. And recently, greater possibilities for solutions have been offered by the method of finite element analysis.

In friction and wear problems, particular attention must be devoted to the assignment of laboratory results obtained with real couples, given not only the differences which sometimes exist in kinetics or the nature of the contact, but especially the heat dissipation mechanism -- a determining factor -- which is associated with shape, mass, and environmental conditions.

The material effort being made to create in Romania possibilities for modelling operating conditions through programming, is needed to improve the accuracy and validity of results for specific cases.

The selection of oils as a function of purpose, the stress placed on oils in supercharged engines, extending the period between oil changes in industrial gear reducers, and methods for establishing the performance characteristics of cutting oils, are but some of the requests which production is addressing to research in connection with lubricating materials.

Of great economic interest is the quality improvement of industrial oils and their regeneration after use. Economy requirements also impose the need of scientific research into maintenance and consumption standards in lubrication technology, as well as the organization of lubrication techniques in industrial enterprises.

In the vast field of tribology, the ideas mentioned here can only represent a few examples and suggestions.

Given the great dispersion of research forces and material resources, there appears to be an obvious need for concentration and for a closer focusing on priorities, as well as for a coordination of efforts.

The large number of problems which are awaiting to be solved draws attention to the need for increased research potential, for a more complete material base, and for educating tribology specialists at various levels.

A closer collaboration must be established among scientific researchers in the higher technical education, departmental institutes of MICM (Ministry of the Machine Building Industry) and MICh (Ministry of the Chemical Industry), INCREST, and CMS (Center for the Mechanics of Solids) in order to find and solve comprehensive priority problems through programs.

This implies a confidence in Romania's creative ability, a sense of future perspective, mutual understanding, and a common language.

Tribology researchers have made an outstanding effort in this respect, by solving problems assigned by production, disseminating the results of their research, and by raising the awareness level among designers and within enterprises.

Given the difficulties and magnitude of information gathering activities, of applying regulations, and of introducing a new order through organizational measures, there is a need for intervention on the part of the proper superior agencies.

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PROGRESS, SHORTCOMINGS IN INDUSTRIAL RESEARCH NOTED

Belgrade PRIVREDNI PREGLED in Serbo-Croatian 4 May 77 p 3

[Excerpts] Last year was the second year in which the highest results were attained in activating the domestic potential in technical and technological creativity. About 2,400 economic organizations signed self-management agreements to promote innovative activity and the drawing up of statutes on royalties. The number of inventions almost doubled (over 1975), while the financial results of their application amounted to 10 billion dinars.

Although the data from last year have not been statistically processed, seen as a whole, they are encouraging. They form the basis for one of the conclusions of the recent meeting of the Council on the Year of Technological Inventions which said that these facts form solid foundations and an appropriate climate for the future development of domestic creativity. But when one reads the statistics from 1971 to the end of 1975, one realizes that, despite the results achieved, old habits are changing slowly and creative potential is difficult to activate.

According to the Federal Bureau for Statistics, from 1971 to the end of 1975 technical-innovative activity existed in only 936 work organizations, that is, in only 6.9 percent of all Yugoslav work organizations, not including those in the province of Kosovo.

It is immediately seen that the number of organizations in which work on technological innovations is being developed is very small, although these include the largest Yugoslav economic complexes. These enterprises include 20.2 percent of the workers employed in the economy, 22.8 percent of total fixed assets, and account for 43 percent of the total social product.

In 1975 all sociopolitical forces, from those in OOUR's (basic organizations of associated work) to the federation, were engaged in promoting invention in production. One of the aims was to form special services for invention in work organizations, to revise existing regulations on this, and to create regulations where there were none. However, a relatively small number of work organizations responded to this. Conservative

structures slowed down such attempts even where this activity had already been present. In only 64 organizations such activity was being performed in patent sections, while such activity was being performed in sections for technological innovation in 128 organizations, in specialized services of 359 organizations, and in research and development units in 284 enterprises.

Logically, most research work should be done by teams. This rule does not hold within our domestic framework, which [fact] points to the disorganized nature of such work. In the last 5-year period the groups composed of three or more persons produced only 89 of the total of 721 inventions, while 359 inventions were the work of individuals. These individuals included 210 with a university-level education and 78 with a secondary school education.

Since the organizational conditions for promoting innovative action are very important for achieving results, it is understandable that Slovenia which has the best conditions registered the largest number of inventions (403 of the 721), followed by Croatia (240), Serbia (including the province of Vojvodina but not Kosovo) (58), while Macedonia registered only 6. The same proportion holds true for the number of inventions submitted to and approved by the Federal Patent Bureau.

In research and the application of its achievements it seems as if everything is proceeding in haphazard fashion without much economic or market logic. The fact that only 368 of the total number of inventions have been put into use, that is, a little more than one-half, best attests to our business mentality which is not yet liberated from subjectivism.

Experience shows that an invention is of value only when it is applied. With the application of 145 inventions costs were reduced by about 178 million dinars, while 158 inventions contributed to increasing income by 225 million dinars [in the 1971-1975 period].

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